

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/001997

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Cover sheet

INTERNATIONAL PATENT CLASSIFICATION (IPC) :

H02H 3/26 (2006.01)

H02H 7/045 (2006.01)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____ ,
which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- ☐ the international application as originally filed/furnished
- ☒ the description:
pages 1 - 18 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
- ☒ the claims:
pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 1 - 3 received by this Authority on 28 - 10 - 2005
pages* _____ received by this Authority on _____
- ☒ the drawings:
pages 2 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-7</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-7</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-7</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Reference is made to the following documents:

D1: US6483680

D2: US5784233

D1 discloses a method for protection of power transformers. The method comprises generation of differential current signals and phasor signals, subsequently analyzing currents in the complex plane. The document discloses differential measurement of the terminal currents (column 1, lines 23-31). The current measured is characterized as the inrush current of the transformer. The inrush may be caused by, for instance, evolving internal faults (column 1, lines 44-67). Consequently, the method proposed by D1 is not solely directed to switching a transformer on, although it is the most severe case, but to the power-through as well.

D2 discloses a numerical differential protection device for a power transformer. All the phase currents of the transformer are measured. A neural network identifies fault conditions.

The problem solved by the invention is detection of low-level internal faults in power transformers, for instance turn-to-turn faults.

D1 is considered being closest in describing the invention.

The invention according to claim 1 differs from D1 by stating calculation of the contributions of the negative sequence currents and comparing relative positions in the complex plane. Comparison in the complex plane is disclosed in D1, but for second harmonic components only. As to the phase angle

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Supplemental Box

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Continuation of: BOX V

difference between negative sequence current components, this is not disclosed in D1 in the same manner as is stated in claim 1.

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT) and is considered to involve an inventive step (Article 33(3) PCT).

Claims 2-7 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

The invention is industrially applicable.